What is the “Best” Setting for Endovenous Laser Ablation? - A Pathological Analysis -

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Objectives-1

Create a new standard technique of endovenous laser ablation (EVLA) for great saphenous veins in patients with varicose veins in their lower limbs.
Objectives-2

What is the goal of this new technique?

- Prevention
- Perforation
- Occlusion
- Regression (Cord-like Structure)
- Recanalization

EVLA
Objectives-3

- In the present study...
  ...we reveal the mechanism of EVLA using pulsed wave laser.

- continuous wave laser
- pulsed wave laser
## Methods

<table>
<thead>
<tr>
<th>Group</th>
<th>Power</th>
<th>Frequency</th>
<th>Velocity</th>
<th>LEED</th>
<th>Peak Power</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>Hz</td>
<td>mm/sec</td>
<td>J/cm</td>
<td>W</td>
<td>legs</td>
</tr>
<tr>
<td>Group A</td>
<td>4.0</td>
<td>20</td>
<td>1.0</td>
<td>40</td>
<td>571</td>
<td>10</td>
</tr>
<tr>
<td>Group B</td>
<td>5.0</td>
<td>30</td>
<td>1.0</td>
<td>50</td>
<td>476</td>
<td>10</td>
</tr>
<tr>
<td>Group C</td>
<td>6.0</td>
<td>40</td>
<td>1.0</td>
<td>60</td>
<td>428</td>
<td>10</td>
</tr>
<tr>
<td>Group D</td>
<td>7.5</td>
<td>40</td>
<td>1.0</td>
<td>75</td>
<td>535</td>
<td>10</td>
</tr>
</tbody>
</table>

PATIENTS with chronic venous disease who underwent EVLA
Methods-2

1320 nm Nd:YAG Pulsed Wave Laser

Automatic Pullback Device

2.5 F SaphFire Sterile Single Use Fiber
Alterations after EVLA

EVLA using pulsed wave laser (1320 nm)
Polarized EVG

without EVLA

Alteration after EVLA
Perforation and Defect

Perforation

Defect
Great Saphenous Veins in limbs with chronic venous disease (did not undergo EVLA / were not included in this study)
Strong Thermal Changes in GSV

HE | Azan | EVG

EVL A using continuous wave laser (980 nm)
(not included in this presentation: in vitro study)
## Results

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.0W20Hz</td>
<td>5.0W30Hz</td>
<td>6.0W40Hz</td>
<td>7.5W40Hz</td>
</tr>
<tr>
<td><strong>Peforation</strong></td>
<td>0 case (0%)</td>
<td>0 case (0%)</td>
<td>0 case (0%)</td>
<td>1 case (10%)</td>
</tr>
<tr>
<td><strong>Defect</strong></td>
<td>1 case (10%)</td>
<td>2 cases (20%)</td>
<td>7 cases (70%)</td>
<td>2 case (20%)</td>
</tr>
<tr>
<td></td>
<td>52.2 nm</td>
<td>122.2 nm</td>
<td>105.3 nm</td>
<td>533.0 nm</td>
</tr>
<tr>
<td><strong>Alteration</strong></td>
<td>5 cases (50%)</td>
<td>5 cases (50%)</td>
<td>2 cases (20%)</td>
<td>4 case (40%)</td>
</tr>
<tr>
<td></td>
<td>584.4 nm</td>
<td>710.5 nm</td>
<td>708.3 nm</td>
<td>696.7 nm</td>
</tr>
<tr>
<td><strong>Thickness of Vein</strong></td>
<td>345.2 nm</td>
<td>357.5 nm</td>
<td>404.2 nm</td>
<td>417.3 nm</td>
</tr>
</tbody>
</table>
Discussion-1

- Recanalization: only 0.5% (in our hospital)
- There are few histological studies about EVLA available.
- EVLA using...
  - Pulsed wave laser
  - Chopped pulse wave laser
  - Continuous wave laser

We highlight it this time
In most cases, the treated great saphenous vein was not identifiable 6 months after the EVLA using 1320 nm pulsed wave laser.

The actual energy delivered to the vein wall is different from the intended amount.

In EVLA using continuous wave laser...

70 J/cm $\leq$ LEED $\leq$ 110 J/cm

Too low

recanalization

Too high

perforation

Beware: Narrow therapeutic window.

Theivacumar NS. Eur J Vasc Endovasc Surg 2009
der Kinderen, D. Dermatol Surg 2009
Conclusion

EVLA using pulsed wave laser in the energy range in this study could alter the vein wall without strong thermal changes.